ILRI Forage Factsheet



Planting and managing forages

Crop establishment

Successful establishment occurs when the radicle becomes anchored in the soil, absorbing moisture and nutrients for the growing shoot. This shoot emerges through the soil surface to display a leaf that photosynthesises sufficient energy to make the seedling independent of its seed energy reserves.

Seedling emergence depends on a complex interaction involving seed placement, size, hardseededness, genotype and the micro-environment (the seedbed). Grazing, trampling and uprooting also affect establishment. In sown or self-regenerating species, sward composition can be very variable at the end of establishment especially if other species are present.

All seeds must compete for resources to:

- germinate (suitable temperature, water, light and oxygen)
- expand their resulting leaves (suitable temperature, light, vapour pressure deficit and exposure)
- penetrate with their roots (suitable soil tilth, aeration, pH, fertility and moisture).

Establishment requires conditions favourable for germination, emergence and growth. It also requires conditions favourable for vegetative material to initiate new roots and shoots. It may also require destruction/weeding of unwanted plants which could dominate the newly established crop.

This is the most hazardous phase in plant growth and extra care should be taken to ensure a good seed crop.

Pasture seed crops warrant more care during establishment with better land preparation, more precise sowing techniques, higher seeding rates and even additional operations (e.g. herbicides, irrigation) not normally used with pastures. This ensures that new areas establish and produce adequate populations such that extra seed is not required to 'gap fill' the crop.

Establishing a pasture seed crop

The following general practices should be considered when establishing a pasture seed crop:

Land clearing

Newly-cleared land is often used for seed crops to ensure less competition from weeds and other pasture plants (and therefore less contamination of the crop). This is particularly important with some of the less competitive legumes where less fertile land is used. This can also be the case with more competitive grasses where no suitable pre-emergence herbicide can be recommended. New stands planted on old weedy cultivations may not produce a worthwhile seed crop in the first year.

Seedbed preparation

For seed crops, thorough land preparation is essential to provide a clean, firm and fine seedbed. Land levelling is advantageous for irrigated systems or mechanized harvesting. Rough, weedy underdeveloped/underprepared seedbeds may cause poor establishment giving poor plant populations which allow uneven tiller and seed maturation.

Cultivation affects the size, distribution and packing of soil particles. It provides a tilth next to the seed and should optimize the condition of the soil surface to maximize emergence, water infiltration and maintain gas diffusion to avoid short-term anaerobic conditions caused by slaking and crusting.

Weed control

Weed control measures taken in the seedbed help ensure successful establishment. Pre-emergence herbicides may be used but are too expensive for many seed producers. The selection of planting time and hand weeding (where cheap labour is available) are alternative methods of weed control.

Weeds can reduce seed yields through competition and contamination. Some seeds are sacrificed during cleaning to remove the weed; clean seed comes from clean fields. Control measures are less critical for legumes because well established and fertilized crops compete strongly with weeds.

Fertilizer requirements

Adequate fertilizer applications are required to promote plant growth and subsequent seed production. General pasture recommendations are usually followed for pasture seed crops as well. Fertilizer should be evenly distributed. On less fertile soils, 50 kg N/ha should be applied to grasses at establishment but this dressing can be reduced or eliminated when the soils are considered fertile.

Mixing fertilizer with seed at time of sowing can result in an interaction which reduces germination and inoculant effectiveness.

Time of sowing

Planting time depends largely on the reliability of rainfall and potential evapotranspiration. Early sowings have the best chance of producing a good harvest. Within given areas, small niches may exist which allow for different timetables to take advantage of rainfall extremes, irrigation and weed control patterns.

Choice of vegetative material or seed

Vegetative material may be in the form of rhizomes, stolons, stem pieces or cuttings (splits). Such materials are genetically identical to the parent plant. Whether seed is sown by hand or machine good quality seed must be used. If the resultant crop is to be certified, seed of the appropriate status or generation must be used.

Inoculation

Certain legumes are very specific in their rhizobium requirements and failure to inoculate such seeds before sowing could lead to poor nodulation and subsequent poor plant growth. Other legumes are known to nodulate readily and successfully with native strains of rhizobia; but even here, inoculation is a cheap precaution against failure especially where legumes have not been sown before.

Seeding rate

As an approximate guide, seeding rates for forage seed crops should generally be at least twice those recommended for normal pasture sowings. In the first season of production, growth of pasture, weed suppression, avoidance of erosion, amount of nitrogen fixed by sown legumes and the grazing returns are greater for high sowing rates (Humphreys 1978). With higher sowing rates, the need for later 'thickening up' of the seed stand should be minimal. Lower seeding rates are recommended for row planting compared with broadcast sowing. However, the temptation to save too much should be resisted as it could lead to a sparse, weedy stand producing low seed yields in the early years. If low quality seed has to be used, e.g. seed of good genetic quality but of low germination percentage and low purity, the sowing rate should be increased.

Spatial arrangement and plant density

Row planting is often recommended to facilitate rogueing (weeding out) of off-types and to allow interrow cultivation for weed control during early establishment. This is of value to tussock grasses and vigorous sprawling legumes but serves little or no useful purpose to stoloniferous grasses and to weakly competitive and/or creeping legumes. For the latter groups, broadcast sowing is usually preferable. In all cases, however, seed should be evenly distributed within the limits of the spatial arrangement chosen.

Proximity to already established materials may result in growth being retarded by shading and drying out because of root mass. Annual plants must re-establish every year and some control of plant density may be necessary if seed production is not to be reduced. Similar considerations also apply to perennial plants which lack vigour. Seed areas should be renovated and re-established when seed production starts to decline.

Depth of sowing

One of the commonest causes of failure in establishment of small-seeded species is sowing too deeply.

Maximum sowing depth is constrained by endosperm reserves which must be adequate to support hypocotyl or epicotyl elongation until seedlings emerge above the soil and begin photosynthesising. The elongation rate is a function of genotype, temperature, soil and water. Thus, the timing, rate and depth of sowing are critical. Since most pasture plant seeds are relatively small, they are generally sown on the surface of the soil or incorporated to not more than 1 cm depth. The use of sowing machinery that enables control of depth of sowing is desirable although many small farmers are able to establish the crop successfully by hand broadcasting.

Pests and diseases

Various caterpillars can affect grass seed crops. Rats and mice can also cause considerable damage by cutting ripe heads off and birds damage inflorescences. Ergots, smuts and virus infections are important diseases of forage grasses.

Pests and diseases are generally more severe with legumes than with grasses. Insect pests include moth caterpillars, sucking bugs and butterflies that are seen feeding on pods and flowers. The Leucaena psyllid is a well-known small sucking insect, which is devastating *Leucaena leucocephala* plantings. A wide range of diseases can affect different legumes. The more important ones are rhizoctonia leaf blight, anthracnose in stylos, rust on Siratro and viruses on many species. In practice, it is advisable to grow susceptible crops where the disease risk is low.

Weed control

Legume seed crops are particularly vulnerable to weed invasion. Weeding is comparatively easy in these crops, particularly if they also form a vigorous smothering canopy. In other leguminous crops where a dense smothering canopy is difficult to form, weed control is obviously more difficult.

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